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Running Title: Fluoride Exposure and Risk of Children

Key words: fluoride, multi pathway, children, exposure, risk

Abbreviations:

ADA: American Dental Association
EDI: Estimated Daily Intake
AT: Averaging Time
CDC: Centers for Disease Control
CTE: Central Tendency Estimate
ED: Exposure Duration
EF: Exposure Frequency
HI: Hazard Index
HQ: Hazard Quotient
IRIS: Integrated Risk Information System
LOAEL: Lowest Observed Adverse Effect Level
NAS: National Academy of Sciences
RfD: Reference Dose
RME: Reasonable Maximum Estimate
TUIL: Tolerable Upper Intake Level
WHO: World Health Organization
USDA: United States Department of Agriculture
USEPA: United States Environmental Protection Agency

Paper Outline

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Abstract

The prevalence of dental flourosis in the United States has increased during the last thirty years. In this study, a mathematical model commonly employed by the USEPA is used to estimate average daily intake of fluoride via all applicable exposure pathways contributing to fluorosis risk for infants and children living in hypothetical fluoridated and non-fluoridated communities. Hazard Quotient for each exposure pathway and Hazard Indices are also estimated for exposure conditions representative of central tendency (CTE) and reasonable maximum exposure conditions (RME). The exposure pathways considered are uptake of fluoride via fluoridated drinking water, beverages, cow's milk, foods, and fluoride supplements for both age groups. Additionally, consumption of infant formula for infants and inadvertent swallowing of toothpaste while brushing and soil for children are also considered. The cumulative daily fluoride intake in fluoridated areas was estimated as 0.20 and 0.11 mg/kg-d for RME and CTE scenarios, respectively, for infants. On the other hand, the RME and CTE estimates for children were 0.23 and 0.06 mg/kg-d, respectively. In areas where municipal water is not fluoridated, our RME and CTE estimates for cumulative daily average intake were 0.11 and 0.08 mg/kg-d for infants and 0.21 and 0.06 mg/kg-d for children, respectively. Our theoretical estimates are in good agreement with measurement-based estimates reported in the literature. Although CTE estimates were within the optimum range for caries prevention the RME estimates were above the upper tolerable intake limit. This suggests that a segment of the children population may likely be at risk for fluorosis.